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ALTERNATIVE FINANCING METHODS FOR CLEAN WATER

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ALTERNATIVE FINANCING METHODS FOR CLEAN WATER

ECONOMIC REPORT

CLEAN WATER

ENVIRONMENTAL PROTECTION AGENCY
Office of Water Programs

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ECONOMIC REPORT

ALTERNATIVE FINANCING METHODS FOR CLEAN WATER

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WATER PROGRAMS

September 1971

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ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 1 1971

Honorable Spiro T. Agnew
President of the Senate
Washington, D. C. 20510

Dear Mr. President:

I am transmitting to the Congress a study of alternative methods for financing the costs of preventing, controlling and abating water pollution as required under Section 109 of the Water Quality Improvement Act of 1970.

This study draws upon various background studies and contractors' efforts including the Cost of Clean Water Reports previously submitted to Congress.

The report provides a broad general survey of possible financial incentives for controlling and abating pollution. It is becoming increasingly clear that financial incentives, if properly applied, can provide valuable supplements to our basic standards setting and enforcement responsibilities. While some of the concepts considered in the report are clearly unworkable or have low priority, others offer significant promise for further development.

The basic conclusions of the report concerning the financing of municipal waste treatment are already reflected in proposed

legislation transmitted to the Congress as part of the President's 1971 Environmental Program. These measures, which are incorporated in the proposed bills provide financial assistance for the construction of sewage treatment works and for the development of the financial and administrative capability to provide for future municipal waste treatment needs. It has also been proposed that an Environment Financing Authority be established to assist those communities which are unable to obtain municipal bond financing.

The Council on Environmental Quality and the Environmental Protection Agency are continuing to study this complex issue. If further study demonstrates that some of the other concepts presented in this report can serve as the basis for viable legislative proposals, these new initiatives will be submitted to the Congress at a later date.

Sincerely yours,

William D. Ruckelshaus

William D. Ruckelshaus
Administrator

ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 1 1971

Honorable Carl B. Albert
Speaker of the House of Representatives
Washington, D. C. 20515

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SUMMARY AND CONCLUSIONS

In the past few years, there has been increasing discussion about the use of financial incentives to help prevent and abate water pollution. This report examines an array of alternative financial methods for meeting societal objectives in the water pollution field. The report considers various point and non-point sources of pollution and discusses alternative financing methods for correcting these problems.

1. Industrial Wastes

The waste discharges of manufacturing establishments, thermal power plants, mines, and large scale animal feeding operations are similar in that they tend to occur more or less continuously, to be subject to collection and discharge at a limited number of specific points, and to be readily subject to control technology.

An alternative considered for financing the treatment of industrial wastes is a system of effluent charges which imposes a direct charge on industrial discharges. The effluent charge can be set high enough to discourage adverse levels of waste discharge and accelerate the rate of water quality standards achievement.

Although an effluent charge program has considerable potential, additional study is required before such a program could be instituted. This includes study of the economic impact of effluent charges on the financial structure of firms, and development of the mechanics for administering this highly complex program.

Other alternative financing methods including subsidies, excises and purchasing of assimilative capacity are reviewed, but are considered less effective, efficient and manageable.

2. Municipal Waste

Municipal wastes include not only the domestic wastes of sewered communities, but also commercial and industrial discharges.

This report describes several innovations which are incorporated within the President's 1971 Environmental Program. It encourages continued Federal grants to overcome the backlog of construction needs, and supports the Environmental Financing Authority, which would insure underwriting of municipal bonds for waste treatment facilities.

As a strategy for increasing municipal self-sufficiency and fairness in payment for facilities, the report examines a treatment works user charge system. This system is also included in the President's program for several reasons. First, the users who benefit, pay for

the service. Second, user charges provide an incentive to industry to improve waste discharging practices by encouraging pretreatment of wastes discharged to municipal systems, and by encouraging adoption of less polluting manufacturing processes. Third, when the cost of the service is directly borne by the user (residential, commercial or industrial), an incentive exists for insuring that the treatment system is effectively planned and managed.

Other alternative financial arrangements reviewed include river basin systems, full Federal capitalization, total elimination of Federal financial participation and Federal loans.

3. Agriculture

Agricultural activities create pollution stemming from increases in salinity, sedimentation, animal waste discharges and increased use of fertilizers and pesticides.

In the case of agricultural sedimentation, Federal soil conservation programs offer promise of achieving significant results. The problem of agricultural runoff of fertilizers and pesticides could be addressed from a financing point of view by changing grants-in-aid or cost sharing arrangements to assure that assistance encourages reduced pollution as well as increases agricultural productivity. Other approaches are effluent charges or excises imposed on agricultural products. At this time CEQ, EPA and the Department of Agriculture are conducting a detailed analysis of this problem.

4. Construction

Runoff from construction sites, generally in the form of soil sediments, is another source of pollution that must be considered. When local erosion controls are applied to the housing industry in either sewered or nonsewered areas, the costs of such control are included in the price of the product. Since the estimated additional cost per dwelling unit for erosion control is small, it is unlikely that any specific program of financial aid for pollution control purposes need be developed for either the contractor or the purchaser.

Sediment run-off during road construction is also a source of pollution. Because of the relatively low cost involved in erosion control insistence upon good construction management would make special funding or financing arrangements unnecessary.

5. Mine Drainage

Acid mine drainage constitutes a serious water pollution problem and a difficult question of financing in that the responsibility for control procedures and thus the incidence of costs, has not been determined.

An effluent charge levied on acid mine drainage of active mines may be expected to stimulate abatement.

However, the issue of abandoned mines is a very different matter as the present landowners are seldom the cause of the problem nor are they usually the owners of mineral rights. At present, Federal efforts for dealing with the problem are concentrated in large-scale demonstration projects.

One alternative method of financing this problem could involve direct use of public funding. Other alternative forms of financing include a severence tax on extracted minerals or an effluent charge on pollution from operating mines to cover all sources of mine drainage pollution (including abandoned mines).

6. Spills

Accidental spills and deliberate dumping of polluting materials, including hazardous or toxic materials, constitute a special and particularly difficult pollution problem. The occurrence of such episodes is inescapable, but not predictable in terms of location or time.

There are two aspects to the spills problem: prevention of spills and spill restoration. The problem lends itself to the use of an insurance scheme, because the spill problem is characterized by a low frequency of spills associated with high clean-up costs, for any given source. This mechanism could be designed to provide a solution to both aspects of the problem.

a. The high cost of spill restoration could be met via the insurance program. The spill clean-up could proceed quickly with knowledge that the costs will be covered. Furthermore, the clean-up costs will not create an undue economic hardship for the parties involved.

b. Measures to reduce the frequency of spill and dumping episodes can be approached through an insurance premium rating procedure, i.e., those operators with poor spill records will be required to pay larger premiums. The rating structure can be set such that an effective incentive could be created to prevent accidental spills.

Another financial instrument that could be employed to remedy the spills problem considered in this report is fines. Fines have a similar preventive effect. Their principle deficiency is that they do not provide assurance that the technical or financial resources will be provided by the spillor. Also, it is difficult to assess variable fines that can be imposed on the pollutor via the premium rating mechanism of the insurance program.

INTRODUCTION

This report to the Congress is in response to Section 109 of the Water Quality Improvement Act of 1970 in which Congress directed the Secretary of the Interior (this function now resides with the Administrator of the Environmental Protection Agency) to:

> . . . conduct a full and complete investigation and study of the feasibility of all methods of financing the cost of preventing, controlling, and abating water pollution, other than methods authorized by existing law. The results of such investigation and study shall be reported to Congress . . . together with the recommendations of the Secretary for financing the programs for preventing, controlling and abating water pollution . . . including any necessary legislation.

The importance of such a study to the achievement of water pollution control objectives must be recognized. No environmental program can be effective without adequate funds, from whatever source, to install, operate, replace and upgrade necessary control equipment; to allow for process or control changes; and to provide for monitoring, enforcement and technical support by the program. The necessity for control measures and their funding applies to all pollution sources--point and nonpoint, including all variants between.

In order to meet such a broad charge it was necessary to investigate in detail various technical, financial, institutional and cost aspects of major pollution sources. The current and likely future situation had to be assessed to determine financing needs, the potential for improvement within the present system to reduce financing needs; alternatives that might be used to meet the needs; and the possibilities for joint uses of funds in providing for more efficient and effective achievement of water pollution control goals.

Quite apart from the quantitative adequacy of funds--perhaps even more significant in the long run--are questions of incidence and efficiency. The matter of how much of our resources must be devoted to water pollution also includes the question of who shall bear that cost, and how the costs are to be allocated. Competition for public funds among all the various ongoing and proposed public programs is severe. Even at the highest level of government there is a finite amount of money available to be used for the public good. Therefore, these monies must be rationally allocated among the competing programs to achieve the greatest overall benefit to society.

For any single program there is seldom too much money allocated since additional work can always be undertaken. However, there is a level of adequacy in this single program beyond which (in terms of the overall good of the nation) the available monies can be most effectively spent in achieving the goals of some competing program. "Adequate" or "enough",

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while not incompatible with "too much" for the narrow goals of water pollution control, should be viewed in terms of the total national economy, and long term competition for resources among a variety of equally worthwhile--even necessary--purposes.

The study consists of four separate but closely related parts: (1) Point sources of pollution including municipal, industrial, storm and combined sewers, and large animal feedlots; (2) Nonpoint source pollution, primarily rural runoff, small feedlots, and other animal raising or feeding operations, and nonsewered construction runoff; (3) Modified point sources, including spills of oil and hazardous or other materials in any situation (i.e., transportation, transfer, storage, production, or processing); (4) Modified nonpoint sources, covering all types of mining. This report draws heavily upon contemporary literature on the economics of water pollution control and technical studies of the Environmental Protection Agency.

This report points out that in essence there are only three sources of payment for pollution control: taxpayers, consumers, and producers/owners. Although these three may be the same person, they do represent different sources of payment as a result of the differences in the incidence or share of the cost that is borne in each case. Based on this conclusion, the report discusses what is thought to be effective, efficient, equitable, and incentive-oriented systems for payment of pollution prevention, abatement, or control costs. However, it recognizes that constraints or interactions with other programs may dictate divergence from these systems.

In addition to considering the question of how to pay for pollution control over time, the report also considers the question of how to raise the necessary initial capital for facilities. There are a variety of methods for raising capital but once the general method of payment has been established specifics become a matter of preference and circumstances rather than of necessity. Likewise, the question of administration of capital raising, fund collection, and fund disbursement is not crucial to the financing aspects if payment is assured. For example, the payment systems discussed include broad revenue producing mechanisms that may be used to provide all or some portion of the funds required for a public, quasi-public or private pollution prevention, abatement, or control system. Table 1 summarizes the major alternatives considered in this report.

TABLE 1

SUMMARY OF FINANCING ALTERNATIVES RELATED TO POLLUTION SOURCES

Sources	Alternatives
Municipal	Limit Federal aid and assure a system of local financial self-sufficiency Complete Federal capitalization Surtax and trust fund Private assumption Local and State initiative Loans
Industrial	Effluent fees Fines Public assumption Private choice Private utilities Enlarged subsidies Excise tax on polluting products Auction of discharge permits
Mining	Effluent fees Excise taxes Fines Public assumption Insurance and bonding Beneficiary charges
Construction	Pass through of higher operating costs Insurance and bonding Fines
Spills	Insurance and bonding Fines
Agricultural	Federal performance subsidies Excise tax on polluting inputs Special loan fund Fines

METHOD

The purpose of this report is to consider alternative means of financing water pollution control measures. Because the number of financing arrangements is almost unbounded--given the possibility of shadings, refinements, and combinations of a few basic financial mechanisms--and because quantitative relationships depend in considerable measure upon the quality of financing procedures employed, this report will be restricted to discussions of generalized relationships. Quantitative assessments can, however, be developed for specific applications.

Although the analysis is conducted on the broadest level of generalization, the complications involved in full discussion of the relationships between even the most basically defined financial alternatives argue against an exhaustive discussion of the relative merits of each. Rather, this report discusses the application of specific sets of financial arrangements to general categories of polluting activities, and suggests such other financing procedures as may be considered to be appropriate for application to the circumstances. To maintain the discussion at a manageable level of detail, variants of the basic financial constructs are ignored. Alternatives, then, are presented largely in terms of the broadest kinds of distinctions, and are considered to include arrangements among seventeen categories or processes, as follows:

Ultimate Sources of Funds	Consumers Taxpayers Producers/Owners
Revenue-Producing Mechanisms	Income Taxes Excise Taxes Property Taxes Internally Generated Funds of Firms Discriminatory Pricing User Charges Emission Charges Actuarial Assessments Sale of Discharge Rights
Fund-Disbursing Mechanisms	Direct Purchase Subsidies/Grants Loans Rents Revolving Funds

BASIC ASSUMPTIONS

This report discusses in some detail a specific mix of financing measures considered to be desirable in that it embodies, in manners that reflect the characteristics of particular polluting activities, features intended to:

1. Build into the price of the polluting product or service the cost of reducing or eliminating its pollution associated features;

2. Provide cost-avoidance incentives to independently motivated economic units to reduce the polluting effects of activities through processing, management, and research efforts;

3. Provide sufficient revenues to fund all of the costs of water pollution control;

4. Supply a quasi-market mechanism to allocate resources on the basis of response to environmentally-induced goals rather than on the basis of supply of funds elicited through political bargaining processes.

All of these features are considered to be desirable from the standpoint of economic efficiency, and to be consistent with the maximum attainment of water quality levels embodied in State and Federal laws and regulations. They are not, it is recognized, necessarily consistent in all respects with other institutional and social values or goods competing for the limited available financial resources. Therefore, the collective judgements of public representatives may call for financial mechanisms that are less efficient in purely economic terms but that better reflect other social purposes that may be considered more desirable. To attempt to array the range of valid financial alternatives available to the categories of polluting activities--but without going to the detail made possible by the near infinite range of possible financial arrangements and their combinations--general classes of alternative financing expedients are presented in this report but only in terms of economic efficiency.

In order to present the full force of the argument for economic efficiency it is necessary to state the basic assumptions that underlie the analysis upon which these discussions are based. Those assumptions are considered by the analysts to be incontrovertible--but they recognize that they collide at some points with one generally held view or another. They are:

1. It is not possible to charge all the costs of pollution control to each separate class of pollutors or of beneficiaries of pollution control. All life processes--and many purely physical ones--have the potential to pollute. It is the degree of effect produced by the process that results in pollution, and accidents of concentration or location that make pollutors. Similarly, beneficiaries of pollution control vary by degree; and when the threat is that growth of polluting circumstances threatens to destroy the oxygen cycle, as some qualified observers are coming to fear, then all living things become beneficiaries of pollution control. Questions of responsibility and benefit, then, may be interesting topics of discussion or legal exercise, but they have no economic meaning in the context of water pollution control. Further, the functioning of the economic system provides many opportunities for those initially responsible for the costs of pollution control to transfer those costs to other economic sectors through the exchange process. We may be able to control the points at which costs enter the system, but not their movement through the system.

2. Because the causes and beneficiaries of pollution control efforts are so widespread, the mechanics of exchange will ultimately transmit costs across the broadest possible base. Costs of pollution control are, and will continue to be, added to the prices of goods and services, and borne by the consumers of those goods and services. (There may be a limited exception in the short-run to this situation in the case where a weak market position makes it impossible for a producer to fully pass costs forward through price adjustments and still maintain a competitive position. Such disadvantaged producers may bear a portion of the total cost.) The only meaningful tradeoff in the ultimate incidence of pollution control costs, then, is between citizens in their roles as consumers and as taxpayers.

3. In making the choice of distributing the cost burden between the consumption sector and the tax-paying sector of the economy, there are significant advantages to emphasizing the role of consumption expenditures for their cost regulating merits. If the cost of pollution control is directly inserted into the price structure, many resource allocation decisions may be made automatically, and with considerable discretion available at every point of the production-distribution-consumption chain. Furthermore, where the prices of goods and services reflect relative costs of pollution reduction measures, there may be expected to be a shift in consumer preferences in the direction of a less pollutional--and thus less costly--mix of total satisfactions. The consumer, to a limited degree, would be given a choice--indirectly--as to how much of his income is to be spent for pollution control purposes.

4. To the extent that financing of water pollution control may be incorporated into the price structure, the financing procedure may be considered to be regressive with respect to income distribution.

(Proportion of income devoted to goods consumption varies inversely with amount of income received.) Although compensating adjustments to the tax structure that strike some balance between income level and direct or indirect charges for pollution control can be suggested, there are strong arguments for attacking the income distribution problem through direct, macroeconomic approaches rather than tinkering with subsets of the total problem such as water pollution control.

Furthermore, it is questionable that building pollution control costs into the pricing process is actually more regressive than approaching it through taxing mechanisms. While there are strongly progressive elements in the Federal income tax, State and local government taxes--based largely upon sales and property taxes--are highly regressive in their impact; and opportunities of avoidance by low income groups would probably be as great or greater where prices reflected costs than when costs are borne through inflexible and unavoidable property and sales levies.

5. The costs of water pollution control will be a continuing economic element. The most probable course of events will be one in which pollution control outlays will continue to increase, both in absolute amount and as a percentage of gross national product.

6. Regardless of the extent to which the costs of pollution control are built into the price system and result in allocational, technological, and consumption incentives that effectuate pollution controlling consequences, no completely self-regulating system may be inferred at this time. Incentive features that may stem from rationalized financial procedures can only be viewed as a supplement and influence on existing and future regulatory programs, not as a replacement for them.

POINT SOURCES OF POLLUTANTS

Industrial Wastes

Situation

The waste discharges of manufacturing establishments, thermal power plants, mines, and large scale animal feeding operations are similar in that they tend to occur more or less continuously, to be subject to collection and discharge at a limited number of specific points, and to be readily subject to technological modification to reduce their pollution impacts.

At this time, best estimates are that the majority of manufacturing plants supply some degree of treatment of their wastes either through self-operated facilities or through use of public facilities. Well under half of the electric generating stations in the nation provide wastewater controls. The level of control is generally believed to be negligible in animal feeding and in mining--though the information base is so slight that it is hazardous to generalize. However, it is thought that waste control in mining operations and animal feed lots is presently increasing as a result of active State and Federal programs.

Demand for waste-regulating procedures and facilities originates largely from the external imposition of regulatory pressure, though internal considerations--including public relations values and the social preferences of particular management interests--play some role in demand formation.

The supply of waste modifying processes to meet that demand is presently financed principally out of the internal cash flow of the operating firms, including loaned funds. It must, then, compete with profitable uses of the funds. Delay, in this situation, has a high value since the return on resources witheld from waste treatment measures for use in production and sales purposes continues to be generated during the period of delay. (This factor is certainly a consideration in some instances where industrial wastes are discharged for treatment in public facilities. Even where the full cost of the treatment is borne by the industrial user in the form of user fees, he continues to enjoy a return on some portion of his capital that would otherwise be fixed in treatment facilities.)

An uncertain portion of the cost of industrial waste treatment is borne through *de facto* subsidies provided by Federal and local governments. A significant number of manufacturing establishments--perhaps even a majority--find it convenient or necessary to discharge their wastes to public sewers, so that wastes reduction is accomplished by publicly owned waste treatment plants. It is not unusual that the operations of such plants are financed out of the general revenues of the community. In such cases, only an almost inconceivable coincidence would result in

a correspondence between the factory's property tax payments and the share of total waste treatment costs that it occasions; and whenever tax payments are less than proportionate to waste treatment costs, a subsidy relationship exists. More common than this former subsidy is the one that occurs when waste treatment costs are apportioned through user charges that are assessed as a proportion of the water delivery charge, with progressive quantity discounts built into the rate schedule. The situation results in the provision from other classes of users of a substantial waste treatment subsidy for the large water using factory or commercial enterprise. While such subsidy arrangements are supplied by local government, indirect Federal contributions occur where Federal construction grants have supplied a portion of the waste treatment capital.

Not only do subsidies provided for industrial waste treatment--in whatever form--raise serious equity questions, they also tend to distort the economic decision signals passed to the industrial managers. In effect, industrial waste treatment subsidies make the treatment alternative relatively more attractive than the reuse, recycle, or process changes which would accomplish the same measure of water quality enhancement. Therefore, subsidies can bring about less than optimum economic solutions to the water quality problems. In this regard, legislation proposed by the administration related to industrial wastes treatment in municipal systems would reduce such subsidies from the joint municipal-industrial treatment programs.

Existing arrangements are less than effective not so much because of constraints in financial mechanisms as by reason of the uneven pressure of demand requirements, opportunities to delay in providing controls, absence of incentives to provide controls in an efficient manner, and absence of any means to relate control of pollutants to the profit-making purposes of the firm.

Almost all authorities on industrial wastes agree that the greatest opportunities for waste reduction are to be found in internal modifications of production processes. Controls expressed in terms of waste treatment--whether based on best available treatment technology or percentage of wastes removed by treatment--provide no direct incentive to utilize process modification opportunities. If the producer of wastes is judged in terms of the kinds of treatment facilities that he provides rather than the amount of waste he discharges, he has no external incentive to achieve a net reduction of the wastes that he discharges, since marginal costs in the form of treatment facilities are only indirectly related to marginal revenues, expressed as waste discharge reduction.

When pollution costs are internalized as a result of outside pressures such as water quality regulation or effluent charges, firms may be faced with nonproductive added treatment or control costs. In most cases these costs or a large portion of them can be shifted forward to the consumer--who then has the opportunity to continue consumption of that product at the higher price or to change his consumption pattern. The extent and rapidity of the shifting of such costs are primarily determined by the competitive nature of the industry.

In highly competitive industries it is unlikely that firms can pass on more than a small share of the increased costs due to pollution control in the short run. Additionally, these costs can be passed forward only after a considerable time lag and after a substantial number of adjustments have been made by firms within the industry. These adjustments often entail a period of time during which the firms in the poorest profit position continue in existence only at the expense of their own labor or capital.

Under this situation the demise of failing firms would be hastened and some firms would be shifted from the marginal to the failing category--these latter cases being the only ones whose ultimate closings could be attributed to pollution control costs. A similar situation, but on an even smaller scale, might be found in the fringes of industries characterized as oligopolistic. Occasionally the leading firms in such industries may find it to their advantage to absorb the additional pollution control costs as a public relations or advertising program rather than pass them forward. Smaller firms which do not have advertising advantages or are not capable of passing these control costs forward would find that their profit positions would deteriorate even further, with some firms possibly being forced to close.

By and large, it appears that industrial firms have the capacity to bear pollution control costs--generally by some combination of internally generated funds, subsidies, and the firm's ability to shift the incidence of these costs to the product demander. However, there may be some cases where pollution control costs are beyond the firms financing capacity in the short run although the long run viability of the firm appears sound. The economic impact of pollution control costs on industrial firms is now under study. Included in this study are the areas of domestic and foreign competition as they relate to the various industries and the abilities of firms within these industries to bear pollution control costs.

At the present time, the Federal Government currently offers rapid amortization of capital expenditures for pollution control equipment, and over 30 states provide for rapid amortization, exemption from sales and use taxes, exemption of facilities from property taxes, or some combination thereof.

Effluent Charges

Existing financial mechanisms, which include the use of internally generated funds, loans, the rental of public facilities, and some undetermined measure of subsidy, with the bulk of the burden passed forward to consumers and a lesser share devolving upon taxpayers and disadvantaged producers, seem entirely adequate to finance all necessary water pollution control processes for American industry.

(An indirect expression of that adequacy is to be found in the rising concern of foreign producers that compete with United States firms in international markets. Such producers and their governments, beginning to face the need for environmental protection, are evincing distress at the United States' head start in providing such controls. The feeling is increasingly expressed that because many foreign production activities do not include pollution control measures, the costs of matching the American level of waste reduction will impose a competitive disadvantage on many foreign producers during the coming decade). Conversely, United States' firms often feel at a disadvantage compared to foreign firms located in areas where environmental concerns are unimportant or being ignored, thereby lowering the financial costs of production. Under such circumstances the question of the impact of this situation on United States' industry is raised.

In situations where the environment is being impaired but ignored, it is likely that the financial advantage to the foreign firm is of a short-run nature. On the other hand, there are situations where the environment can absorb greater amounts of residual waste. In this latter situation there may well be a long-run comparative advantage in producing the product for export in those countries with capacity available for wastes assimilation. Foreign production and export under both situations can adversely impact United States' industry but in varying degrees requiring significantly different competitive responses.

The major fault of the present system is not an inability to generate funds and to apply them to environmental purposes, but an absence of direct incentives to use funds for environmental controls. The present system allows profits to be gained from delay and does not provide incentives to operate efficiently.

There is no reason, then, that modification of financing mechanisms for industrial waste producers would take the form of alteration of an effective set of existing revenue producing procedures. Rather, opportunities are to be found--through modification of incentives structures in a fashion that makes it less profitable to pollute than not pollute--to more effectively utilize the existing mechanisms.

Most students of the subject agree that such an incentive is best provided by causing the price of pollutants to be incorporated in the price of products through the imposition of a direct charge on the amount pollutants that are discharged. Where such a charge exists, is universally employed, and is set at a level slightly above the mean

costs of waste treatment, it should produce an incentive to reduce waste by any means whose costs are less than that of the charge, and to do so as soon as the charge goes into effect. Because any such charge is imposed on every non-public source of point discharges, it need not change the competitive situation of firms. (Over the longer term, however, firms whose managements evince greater skill at waste reduction should, ceteris paribus, obtain an advantage over others. More important, total demand should shift to reflect a preference for less polluting products and services, since such goods should be able to demonstrate an innate price advantage where substitution is possible). Further, the existence of direct charges on effluents, by creating a direct economic incentive to reduce the amount of pollutants discharged, would encourage flexibility and presumably more innovative approaches to the problem of eliminating polluting wastes. (Among other prospects is the one that it would encourage science-based firms to develop processes that might be leased to potential users--just as computers are leased today--once a market opened for any process that could reduce wastes at a unit cost to the lessee equal to or less than that of paying the charges).

To be effective, an effluent charge must be broad enough to cover the great variety of wastes that characterize the liquid discharges of different kinds of industrial processes, but not so detailed as to present extreme administrative costs. Although many pollutants may be measured in a number of terms, an optimum charge schedule can probably be framed by reference to a few forms of pollutants. As few as four parameters--total solids, BOD/COD, temperature, and pH--could probably be constructed into a rate schedule that would become a powerful abatement force. (One reason that a more lengthy schedule does not seem appropriate is that a number of directly toxic substances either may not be legally discharged or may only be discharged in such small amounts that their control becomes a matter of specific regulation--e.g., mercury. There seems little point in applying a tax on discharges where discharge is illegal. Fines, of course, could be specified to supplement the direct regulation in such cases, and would constitute an economic incentive of sorts.)

Although an effluent charge program has considerable merit as both a regulating and a revenue producing mechanism, additional study and administrative work is required before such a program can be instituted. Waste discharges and water quality parameters must be studied to determine the minimum number of parameters that can be used and still achieve the desired pollution control results; the charge levels to be associated with these parameters; and the best method of assessing these charges--e.g., flat rates across all industries vs. industry by industry assessment, nation-wide vs. river basin by river basin assessment, and the proper combination of such assessment methods. In addition, the administrative structure for billing the firms, collection of the monies, and monitoring of effluents for payment compliance must be detailed before the effluent charge program can be effectively used. Finally a factor to be considered in the design of the effluent system is to understand the relationship between regulations and effluent charges.

The Environmental Protection Agency is currently engaged in inaugurating other programs that could be used as the basis for administering an effluent charge system. The discharge permit program being instituted under the "Refuse Act of 1899" provides information as to the type and quantity of waste discharges by industrial firms with the monitoring system associated with this program serving as the base for an effluent charge monitoring program. During this same period the Agency is planning to develop the remainder of the necessary administrative structure and to carry out studies of the charge parameters, rates, and methods of assessment.

The merit of the effluent charge system is that it would tend to internalize the financing process within the operations of firms. The principal flaw of the effluent charge as a financial/pollution control measure is the administrative and monitoring structure required for its implementation.

Two appropriate repositories of funds received from effluent fees may be distinguished. Environmental interests have proposed enactment of an environmental trust fund, and revenues derived from an effluent charge could constitute a foundation for such a fund. Depending on the fee structure and the strength of the incentives produced, it is possible that enough revenues would flow from an effluent charge to finance most of the pollution controlling activities of the Federal Government.

Trust funds, however, are subject to attack on a number of grounds, including their demand-creating effects and their inflexibility. From a purely economic point of view, it would be preferable that revenues derived from an effluent charge go entirely to the Treasury, and that the budgetary process be carried out with maximum discretion afforded to elected representatives.

Other Alternative Financial Arrangements

Subsidy proposals have often been raised and a number of subsidies are or have been enacted for industrial waste treatment by State and Federal governments. For the most part, such arrangements involve numerous adjustments of the tax structure, as with the investment tax credit, accelerated amortization provisions, or the feature of several States' tax laws that provides relief from property taxes for properties serving a pollution abatement purpose.

Objections to the use of subsidies center on failures of equity and efficiency. Inequities are said to exist because of the unequal

impact of subsidies--in the case of income tax modification, for example, only profitable firms will benefit. Efficiency failures trace to the absence of performance incentives. Because of the difficulty in separating that which is intended to reduce pollution and that which is adopted for other purposes, subsidies generally apply in practice only to external treatment facilities and practices, thereby offering little incentive to reduce wastes through process modifications or more effective use of facilities, and may by inhibiting management's range of decision, actually constitute disincentives.

To the extent that tax programs such as the investment tax credit for pollution control equipment are deemed appropriate and useful, such programs are compatible with effluent charges. Effluent charges provide an incentive for industries to control their waste discharges while at the same time allowing them the option of determining and using the most economical control methods. On the other hand, tax incentives, unless extremely complex, tend to encourage certain forms of wastes control. However, the two can be used at the same time in that the effluent charges encourage waste reduction and the tax incentives promote specific measures for achieving this waste reduction.

Excises are sometimes proposed as methods to penalize the use of particularly polluting products (e.g., lead in motor fuels or phosphates in detergents). For such purposes, they have an unquestionable utility. But it is the discriminatory pricing feature of excises that allows them to provide an economically effective incentive to reduce pollutional activities. The broad use of excise--as, for example, a surtax or a values added tax to be devoted to financing pollution abatement--defeats any incentive feature, and possesses all of the demerits of any trust fund.

Purchase of assimilative capacity through the open market sale of certificates allowing a discharge up to an acceptable level has been proposed by academic economists as a means to allocate use of the aquatic resource in a manner that provides full scope to market incentives without the administrative intervention of a predetermined price. Objections revolve about the equity of selling a public good to a private interest, the difficulty of making allowance for public waste discharges, and the monopoly position potentially provided to any bidder who might wish to corner the market for waste discharges in a particular watershed.

Municipal Wastes

Situation

"Municipal" wastes include not only the domestic wastes of sewered communities but the sanitary wastes of commercial establishments, collected storm drainage, and the liquid wastes of many urban factories. Analysis of the components of municipal sewerage suggest that in the aggregate manufacturing accounts for at least half the strength and volume of normal sewage (the proportion has been rising), and that wet weather flows often amount to several multiples of dry weather peaks.

At this time, only about a quarter of the recognized communities of the nation are sewered; but that quarter accounts for the overwhelming proportion of all communities with populations in excess of 2,500 persons. In consequence, the sewered population amounts to more than 70% of the total population of the U. S. Of those persons provided with sewer service, an estimated 95% are served by waste treatment--two-thirds by treatment at the secondary, or some higher, level.

Demand for waste treatment capital rises in large measure from the internal forces generated by the existence of public facilities capital. Replacement, upgrading, and extension of service impose constant pressures on the finances of communities. This continuing pressure of demand for capital has exceeded the financial support capabilities of local government. Federal construction grants, since 1956, and State grants, largely coming into play since 1966, have supplied a constantly increasing share of local capital needs occasioned by waste treatment. (Although local government capital outlays for sewerage have been virtually unchanged over the last two decades, with incremental capital requirements supplied by higher levels of government, total waste treatment outlays of local government in constant dollars have approximately doubled, as a result of charges for operation and maintenance of facilities.)

Federal and State grants in aid have been one element of change in a local financial posture determined by the painful need to increase the supply of social and environmental services under circumstances marked by relatively inflexible proprietary revenues derived largely from property taxes.

There has been a growing propensity for local government to fund waste treatment services out of user charges rather than general revenues. Statutory constraints on issuance of general obligation bonds, the growth of industrial wasteloads, and the inability of normal sources of income to meet the rising costs of waste treatment all have played a part in the shift of financing procedures.

Although existing practices represent a slowly progressing improvement over financing mechanisms inherited from the past, they fall far short of an optimum. To the extent that the local share of waste treatment services is financed by property taxes or by user charges that do not adequately reflect the cost of the service, it is regressive in its effect on income distribution, and it fails to provide efficiency and performance incentives. Those incentives are becoming critical as the prevalence and degree of waste treatment expands, and the waste treatment activity moves further out on the marginal cost curve.

The President's 1971 Environmental Program is designed to alleviate many of the problems associated with inadequate local funding of waste treatment programs and with the inherent incentives contained in past construction grant programs to over-construct treatment facilities. Among other things, the proposed legislation encourages grant applicants to develop a treatment works user charge system along with the necessary legal, institutional, managerial, and financial capability to assure adequate operation, maintenance, expansion, and replacement of the treatment works. In addition, the proposed legislation would require full recovery from industry of operation, maintenance, and construction costs associated with treatment of their wastes in a municipal system applying for a construction grant.

There are several reasons why users, including industrial users, should meet a substantial share of the costs of sewerage treatment systems. First, users benefit from the treatment of their wastes and it is equitable that they pay for this service. A properly designed user charge system will enhance the equity characteristics (disregarding for the moment the regressive nature of user charges) by distributing costs in a manner more closely related to the service provided than will other ways of raising revenue.

Second, effectively administered user charges could also improve the management of industrial wastes. Charges related to the cost of treating wastes, based at least on volume and strength, could create an incentive for industrial users to pretreat, change processes, and manage their wastes more effectively.

Third, when the cost of the service is directly borne by the user (residential, commercial, or industrial), he has a vested interest in seeing that the treatment system is effectively planned and managed. This is especially helpful in bringing local pressure to minimize costs through a reduction in unnecessary excess capacity, substitution of operation costs for construction costs where they are lower, efficient plant operation, staging of construction where possible, and use of lower cost technologies if applicable.

Fourth, user charges provide a relatively stable source of revenue with which to meet waste treatment costs which allow for a businesslike management of the sewerage system and provide for an orderly operation, maintenance, replacement, and expansion of the system.

The combination of the institution of a user charge system and the development of legal, institutional, managerial, and financial capabilities to assure adequate operation, maintenance, expansion, and replacement of the treatment works is a major step toward a self-sufficient local treatment system.

Federal, and to a lesser extent State, grants ease somewhat the underlying regressivity of local financing procedures, in that they are elicited from a broader tax base and derived through more progressive structures. Their contributions to equity, however, tend to be offset by inefficiencies that arise out of their forms, and that result in a substantial increase in total cost. Federal and State assistance is unbalanced and uncertain. By providing financing for only a portion of total financial needs of the sewerage system--capital expenditures for waste treatment works--they cause undue emphasis on some features of the system, neglect of others. Collection systems and operation have suffered as a result of the uneven stress on investment for treatment works. Moreover, the incentive to take advantage of Federal assistance while it is available, and in whatever form it is available, has led to indiscriminate proliferation of facilities and overbuilding. Investment has in many cases been unrelated to existing need and directed to physical needs that may arise at some future date when it is feared that Federal aid may be withdrawn.

Many of the undesirable features of local government financing of waste treatment works are no more than extensions of the basic problems of municipal finance--dependence on the property tax, limited and strained borrowing power, increasing demand for government services, and the ability of strong local interest groups to secure effective subsidies through preferential tax treatment. On the other hand, the evolution to self-supporting sewage systems based on user charges and the equity and incentive features introduced by Federal and State grant programs offer the opportunity to improve the conduct of public waste handling services by minor adjustment of financial procedures.

Given that current financing methods for pollution control are not demonstrably deficient in ability to supply funds, but lack allocational merits--flexibility, pertinence, and incentives to improve efficiency in their use. It would be desirable then, that some restructuring of the distribution process take place so that the financial situation of public sewerage services is improved.

In theory, use of an effluent charge should have the same merits for public waste handling as for industrial waste treatment. But the

existing flow of funds for many purposes is from Federal tax collections to local government uses. The prime source of reform then must be local government itself; and extension and rationalizing of the current trend to systems of user fees to support public waste handling utilities would appear to constitute the most useful possible step in this direction. When user charges are employed under a rate schedule that fairly apportions the costs of treatment to those receiving the service, they should generate interest on the part of those paying them--particularly the larger industrial and commercial users--to use funds efficiently and to escape the propensities to over-capitalization, under-maintenance, premature sewering, and excessive dependence on long distance waste transmissions that are common today.

Alternative Financial Arrangements

River basin systems have long been advanced by water quality economists as the optimum device for managing water quality. The key feature of the method is the availability of a central source of decision-making that allocates the waste reduction requirements imposed by natural conditions and a predetermined water quality standard, implements those conditions through whatever combinations of procedures are appropriate, and draws its financial resources from a system of effluent and user charges. Mathematical simulation of the effects of such systems indicate that they have the power to substantially reduce the total costs of attaining any given standard, as opposed to the effects of some uniform imposition of control requirements. Uniformity, with respect to financing, is achieved by the Basin System through the imposition of fees and charges. It does not extend to the physical measures of the control system--in fact, varying imposition of physical and engineering controls is the essence of the system. And the uniformity of charges applies only within the closed system of the watershed. Between basins, a substantial variation in charges should exist. Advantages of the system are that it offers more rapid and more pertinent adjustment to actual or potential pollution situations than other methods, that it widens the focus of attention from the acts of individual dischargers to all of the activities of the watershed, and that it is able to achieve a desired set of results at significantly lower costs than uniform regulation. At the same time, the method is able to spread any savings over the whole body of water users, rather than allowing it to fall to the advantage of single dischargers as would be the case in other variable regulation situations.

For all of its merits, however, the Basin System does not seem to be a practical alternative in the United States. At this time State and local governments do not seem willing to submit a portion of their authority to such inter-jurisdictional institutions; and many industrial

interests have expressed a distaste for allowing the competitive advantages of location that variable treatment requirements would provide to be expressed in the price of products that might be their competitors. Moreover, Federal regulation, expressed in terms of uniform, high waste treatment requirements for administrative reasons does not appear likely to be able to adapt to such purely efficiency-based constructs in the short run. Finally, it should be noted that most of the allocational merits of the Basin System can no longer be captured, due to the prevailing level of controls. We have, in fact, gone so far down the trail of uniform controls that little marginal benefit would accrue in the short run from a general adoption of the basin system. Over the longer run, it is hoped that the set of financial incentives proposed for further study in this report would offer many of the same efficiency advantages.

Full Federal capitalization of public sewerage facilities represents another procedure that could increase efficiency by reducing the force of external competition for funds, enforcing inter-jurisdictional construction priorities, reducing over-building, and lessening the friction between communities that arises out of rate-setting practices and administrative jealousy. At the same time, an entirely Federal investment program would release State and local funds for use in the critical areas of operation and maintenance, and might allow more pointed attention to areas of water pollution control such as nonpoint source controls and management that are currently neglected as a result of the near exclusive emphasis on sewerage.

Such a system, if funded out of existing Federal taxes, would presumably be somewhat more progressive in its effect on income distribution. It might also be funded out of industrial effluent charges (presumably--in the short run, at least--a diminishing source of revenues) and excises on pollutional products. Or an earmarked environmental fund, financed by some surtax arrangement, might become the source of the revenues.

It must be noted that the merits of such an approach are not clear. They rest on the uncertain premise that Federal bureaucracies are somehow more efficient than State and local bureaucracies. Certainly the Federal level has the advantage of a larger national view--but beyond that limited advantage, it is hard to assert any greater wisdom and fairness. (And even that advantage may well be offset by remoteness from the point of impact of decisions.) Further, the possibility of funding a purely Federal investment program for public sewerage raises the possiblity of the enactment of one of those self-perpetuating trust funds that tend to grow beyond the dimensions of effective need, so that the net effect could be a less efficient rather than a more efficient program.

Elimination of Federal financial participation is an equally viable financial alternative. By eliminating direct Federal aid to the activity in question, but diverting the same amount of Federal financial support to other areas of State and local need or to more generalized forms of assistance, the external pressures that result in excess and inefficiency might well be reduced in the conduct of sewerage investments. Certainly more effective latitude would be offered to decision-makers at the level of State government. It is entirely possible, however, that the whole water pollution control effort would be set back substantially, at least in those States where water pollution control has a low priority. The current Federal assistance program reflects overriding national values. To eliminate financial assistance at this time would probably reduce the nation's ability to reach goals of reducing water pollution from municipal sources.

Shifting the incidence of cost by allowing sewer user charges to be deducted from Federal income taxes, either in whole or in part--perhaps on some progressive scale related to income--would enable the current program to continue or to expand, but with less regressive impacts on income distribution. No efficiency or allocational benefits can be adduced for the proposal. Indeed, the net effect might be counter-productive. But the impact of water pollution control would not fall so strongly on lower income groups.

An environmental trust fund, mentioned in connection with a number of alternatives, deserves consideration on its own merits. A trust fund has some relevance aside from its sources of revenues and its methods of disbursement, in that it is an independently functioning pool of resources devoted to a particular purpose and set aside from the general competition among social and economic preferences that take place in political arenas. The argument for a trust fund--which might be financed by surtaxes, contributions, effluent fees, excises, internally generated resources--is that environmental controls, and specifically water pollution control, will be a continuing necessity for our society. They might, then, deserve a sustained source of revenues. A trust fund could function in a variety of means, as a special purpose bank, a loan-guarantee mechanism, a grantor, even a leasor of facilities. It would provide a measure of continuity and independence to the conduct of water quality control activities.

The arguments against such a fund are the arguments made against trust funds in general. For the most part trust funds are criticized because of their: inflexibility; nonresponsiveness; administrative costs; and tendency to encourage questionable projects. The inflexibility comes about whenever funds are placed in trust or earmarked categories to be used only for specified purposes irrespective of need. Nonresponsiveness occurs because the fund size is not related to the requirements of

the fund's purposes. Administrative costs of trust fund arrangements, although not necessarily exorbitant, reduce the amount of money available for fund purposes. The availability of funds in the trust account for specific types of programs often encourages implementation of projects of marginal or questionable value.

A shift to private or quasi-public utilities in the conduct of sewerage activities has been proposed as a means of reducing the dependence of such services on citizen response to ballot measures and of securing access to the broad, private capital market. It is difficult to imagine what procedures could be developed to finance the massive capital transfers involved in the transition to such a system, or to envisage any substantive benefits that might flow from the consignment of an activity now carried out by public bureaucracies into the hands of a private bureaucracy. The arguments for such a transfer, it must be concluded are ideological as well as economic or financial.

It might be pointed out that the absence of the particular kind of private utility empirically demonstrates some preference by consumers in the aggregate for traditional relationships, but it must also be noted that Federal and State government subsidy structures created in the last fifteen years put private firms engaged in the particular market for services at a distinct disadvantage. Broadening the availability of those subsidies would, perhaps, enable any potential private entrants into the market to compete on an equal basis to provide the service. Local consumers could then express their preference for either regulated private utilities or maintenance of existing governmental services.

Loans

Loans to State and local governments could serve two purposes. One purpose would be to help finance the State and local share of the current grant program in those situations where these governmental units are unable to obtain financing through conventional sources. Rather than use loans to overcome this possible financing problem, the Administration has submitted legislation for an Environmental Financing Authority which would purchase bonds from those State and/or local governments unable to issue bonds on their own accord.

A second purpose of loans would be to replace the existing categorical grant program. The amount of Federal assistance would depend on how much lower the Federal lending rates is below conventional borrowing rates of States and municipalities. If the rates are the same, a loan program should produce many of the effects as total elimination of Federal grants, because the loan is to be repaid, there will be an incentive to find the most economical and efficient waste treatment systems. This should help correct the tendancies to excess capacity and inefficiency that have been associated with the grant program in the past.

Further it should be noted that there are other factors aside from the Federal grant presence that are likely to contribute to excess capacity and other system inefficiencies e.g., errors in population projections, engineering design criteria, etc. However tighter Administrative controls are now being implemented, which will to some extent accomplish the same efficiencies. If the rates are different then the loan provides a grant to municipalities.

A complete switching from a grant to a loan program would not be without some transitional costs. Programs and plans of State and local governments are conditioned on the presence and prospect of Federal grants. Withdrawal of Federal support, or at least the lessening of support under this program is likely to retard the water pollution program, at least in those States where water pollution control has a low priority. There still exists a backlog of projects that are needed to bring municipal waste water discharges under control and it appears that the Federal presence will be needed to achieve this end.

For the Federal government to substitute a loan for a grant approach would probably force many States and localities to halt plans for waste treatment construction until institutions and institutional limitations are corrected or accommodated.

NONPOINT SOURCES OF POLLUTANTS

Pollutional Effects of Runoff

Situation

Natural runoff can be enormously pollutional, but there are few purely financial procedures that can be arrayed to reduce or eliminate those pollutional effects. Pollution in such cases is caused by mechanisms that are intermittent, extended in area, and the results of natural processes interacting with man-induced activity. There is no waste stream to modify, only some alteration of geophysical conditions that have undesirable aquatic effects. Relief, then, must come from substantial changes in the way that the society conducts some of its most basic activities, notably agriculture and construction. Economic impacts may be so general and pervasive that financial mechanisms which contribute to the desired results appear to be few in number at this time.

Agriculture

Salinity of waters is a widespread problem in some regions as a result of irrigation development. This problem can be dealt with through adjustments in the technical and financing aspects of reclamation development programs. To the extent that salinity pollution is associated with Federal irrigation development, it could be dealt with through adjustments in the Bureau of Reclamation program.

Such adjustments, however, could involve significant changes in regional agricultural development patterns and in existing water use and water right structures in the western States. The Environmental Protection Agency is investigating problems of basin wide salinity increases, is studying alternative technical control programs, and will continue to explore with the Bureau of Reclamation mechanisms for implementing preventive or remedial programs in connection with Federal irrigation policies.

Sedimentation of streams as a result of agricultural and construction practices is scarcely amenable to financial measures. Higher levels of resource allocation to the problem are necessary to achieve much in the way of incremental control. One possibly meaningful financial incentive is available, however. Enactment of excise taxes on chemical fertilizers might induce a shift in the terms of agricultural production practices such that in some situations it becomes more profitable to employ more soil-conserving practices (crop rotation, use of manures). It must be recognized, however, that any such tradeoff could only be initiated at the expense of distress in both the agricultural and chemicals sectors, that it would probably require considerable time to show a result, and that potentially harmful secondary effects might arise.

Logging and cropping activities, as they are presently practiced in the United States, often result in severe soil erosion and stream sedimentation. However, management practices as well as construction measures are readily available for use in controlling erosion from both of these activities.

In the case of logging activities on Federal lands, lease requirements presently being implemented specify that management practices for erosion and temperature control must be followed. Many of these practices are low cost and primarily management in nature so that significant capital outlays or operating expenses as a proportion of the total logging budget are not necessary. Therefore, specific financing programs or fund raising measures are not discussed for this phase of the industry.

In the case of cropping activities, grants of Federal funds to Soil Conservation Districts have the effect of reducing sedimentation of streams. These grants probably achieve a more immediate response in terms of reducing sedimentation than would excise taxes. In addition to reducing sedimentation, soil conservation practices aid in reducing nutrient and pesticide runoff which also create stream pollution. Specific excise taxes on pesticides could be used to inhibit their use but we are not technologically able at this point in time to differentiate on a continuing charge scale between various pesticides that are allowable. That is, the charge schemes should be directly related to the degreee of environmental damage associated with the product. Some products should be used very sparingly because of their possible damage to the environment and should therefore be taxed at a level to discourage their misuse. Other products are relatively innocuous and should be taxed at a very low level if at all. Between these two extremes of usage is the entire spectrum of products that can be used with differing environmental results and that should be taxed accordingly under the excise concept. For those products that should not be used at all, prohibition is the proper course of action. There is no reason to try and accomplish the same end through taxing the product off the market.

Direct Federal support for current soil conservation practices and sedimentation control would appear to be necessary for several reasons. Complete reduction of erosion offers little prospect of full financial return to most farm units. Capital restraints are considered to be generally more intense in agriculture than in other areas of the economy. Large numbers of independent units must be brought to cooperate to achieve meaningful results. Such grants might well be one of the most productive possible mechanisms in the environmental area, judging from the achievements of the soil conservation programs in the past.

A Consideration for Future Programs

It is impossible to frame a meaningful financial procedure for agricultural water pollution control programs largely because there are substantially no such programs to finance. Certainly the Soil Conservation Service and the land retirement (land removed from crop production) programs have contributed enormously to water pollution control, but this has not been the main purpose of either program.

The Rural Environmental Assistance Program, created out of an existing program of the U. S. Department of Agriculture, provides a restricted means of assisting farmers in combating agricultural pollution. This program provides for limited cost-sharing grants and engineering assistance on specified types of farm related pollution control projects (e.g., pollution from feedlots and land runoff).

In considering the financing of that, or other programs aimed at reducing polluting effects of agriculture, some significant features of the agricultural economy should be kept in mind. Manufacturers, with their markup pricing system, can probably pass the costs of waste treatment or an effluent charge forward very conveniently--so long as the whole manufacturing sector has cause to respond more or less simultaneously to the imposed shift in the costs of production. The same is not true for farmers.

Unlike many other industries agriculture still operates very much in the framework of a competitive market. A variety of producers of homogeneous or interchangeable products who deal with a limited number of purchasers, as is true in the agricultural market, trade at a very real disadvantage. The fact that farm products are largely non-durable goods subject to spoilage and high costs of maintenance when stored adds to that disadvantage. And because of the basic disadvantage in the terms of exchange, price structures shift only slowly to reflect upward changes in prices of product inputs, causing interruptions in production and hardship for the many marginal production units.

National economic policy has reflected an understanding of the underlying disadvantages of agricultural exchanges by a series of measures aimed to support the sector by levies upon the economy at large through price measures. (Technically, these all constitute some form of subsidy, though there are good economic arguments to suggest that the high productivity of American agriculture has actually subsidized the capital accumulation and the growth of the labor supply that has fueled the nation's economic growth).

Construction

Drainage from built-up and urban areas is often a source of pollution, either directly or through over-loading and bypassing of the sewerage system imposed by combined sewers or infiltration. No additional financial mechanisms--or, indeed, programs--seem to be required to deal with most aspects of this problem if the financial flexibility associated with the user charge is accomplished. The problem involved center upon total resource availability and the staging of remedial procedures rather than financial management.

Runoff from construction sites, generally in the form of soil sediments, is another major source of pollution that must be considered. In the sewered areas of urban communities the runoff from construction sites is either channelled through storm sewers to streams or through the combined sewers to treatment plants. In either case, local controls on construction practices, should be used to accomplish the required pollution control.

When local erosion controls are applied to the housing industry in either sewered or nonsewered areas, the costs of such control are internalized. The contractor and the purchaser then, in some combination, become responsible for bearing these costs. Since the estimated additional cost per dwelling unit for erosion control is generally small it is unlikely that any specific program of financial aid for pollution control purposes need be developed for either the contractor or the purchaser.

Road construction projects also contribute to the problem of water pollution from soil sediments. The erosion from these projects is also subject to control regulations. However, the regulations do not impose an impossible burden on either the contractors or the purchasers of their services since control of erosion from such projects is of a relatively low cost nature consisting mainly of good management practices. Because of the relatively low cost involved in erosion control if good management is insisted upon, special funding on financing arrangements related to control of erosion from road construction are not necessary.

Mine Drainage

Acid drainage from abandoned mines does constitute a problem of financing, in that responsibility for control procedures, and thus the incidence of cost, has not been determined. Control of drainage from active mines may be expected to respond to the enactment of an effluent charge, but abandoned mines are quite another matter. An effluent charge would bear upon the present owners of the land, who are seldom the cause of the problem and not always owners of the mineral rights.

One of the commonly proposed solutions to the abandoned mine drainage problem places the responsibility for abatement on the Federal Government, with financing to come from the minerals industry and, implicity, consumers of its products. Two forms of revenue-raising for abandoned mine drainage control have been proposed by various sources--a severence tax on extracted minerals and an effluent charge on pollution from operating mines. Severence taxes are applied to the minerals on some per unit basis as they are extracted from the earth. Such taxes are closely akin to production taxes in that both are tied to production of the product. Application of severence taxes to minerals extraction or effluent charges to operating mines results in higher prices to current or future consumers. The effect of using monies raised in this fashion for control of abandoned mine drainage is to charge current users to clean up problems created in the past. The logic in both cases being that present and future consumers of mineral products are in some sense responsible for past impariments of the environment.

Such logic is dependent on future consumers being the prime beneficiaries of past production. Although this may be true in some cases; it is highly unlikely that the changes in economic activity, consumption patterns, and society in general have not drastically altered the mix of past and potential consumers of mineral products. The more likely result of these changes is a diffusion of the beneficiaries of past production throughout society. As a result, society in general might have to bear some sizable share of the costs of control of pollution from abandoned mines.

Some argue that the local or regional areas should bear a separate share of control costs since their development is a result of past mining operations and they are therefore special beneficiaries of the past activity. However, this argument is difficult to prove since there is some question of the benefit of these past activities versus their exploitations of land, mineral, and labor resources in the mining area.

It has been suggested that an effluent charge be levied against drainage from all mines--operating, inactive, and abandoned. Under such a method the owner of property on which an inactive or abandoned mine is located would have the option of paying the charge (thus identifying the ownership of the mineral rights) or allowing foreclosure for nonpayment of the effluent charges. In the latter situation, the body administering the effluent charge system would be responsible for funding control measures out of revenues from the charges and property sales. The property may be sold after control measures are installed if continued performance is assured.

An effluent charge on drainage from inactive and abandoned mines may have merit if it is tied to mineral rights. Anticipated advantages are: The owner of the mineral rights is required to assess the value of the minerals and to internalize the costs of the pollution based on potential production; and administration of mine drainage control programs is simplified, since owners of the mineral rights would have to come forward to pay the charge or lose their property rights. (It must be assumed that a mine is truly abandoned if the owner of the mineral rights is willing to forego those rights rather than implement pollution control measures).

The problem of reclamation of abandoned mine sites is a massive one. It may perhaps only be undertaken meaningfully with the help of public resources. It would appear, however, that it would yield more efficiently to a measured, staged approach, financed out of normal tax sources through the regular budgetary process than to an all out assault financed by an excise on mineral production or a comprehensive effluent charge.

Effluent charges as discussed in the Industrial Wastes section of this report are also applicable to non-abandoned mines. Since a similar situation prevails in the mining industry as prevails in any other industry, the non-abandoned mine drainage problem was considered within the general effluent charge discussions.

Spills and Dumps

Accidental spills and deliberate dumping of polluting materials, including hazardous or toxic materials, constitute a special and particularly difficult condition of the pollution problem. The occurrence of such episodes is inescapable, but not predictable in terms of location or time.

However, the frequency of deliberate dumps and of accidental spills can unquestionably be influenced by imposition of technical and regulatory controls. The problem's two aspects--post-spill restoration and reduction of frequency--are both amenable to financial incentives.

A significant element of the problem of spills is the matter of size. Attention has focused naturally enough on major disasters, like the breakup of the Torrey Canyon or, the oil well blow-out off Santa Barbara. While such events may have catastrophic effects, the continuing, cumulative results of thousands of individual episodes involving the storage, transfer, and disposal of materials may, in the long run, prove to be more damaging. There is a need to protect against routine dumping of used crankcase oil by filling station operators--the Council on Environmental Quality is currently sponsoring a task force looking into the possible solutions or study needs of this problem--as well as to enforce the use of equipment quality checks, check valves and containment facilities by offshore drilling rigs, transportation equipment, transfer, storage, production, and processing firms and to provide navigation aids for tankers and barges.

Financing Through Variable Spills Insurance and Bonding

The Department of Transportation, under the provisions of the Water Quality Improvement Act of 1970 and Presidential Directive, is charged with the prime responsibility--except for small storage facilities which are the responsibility of the Environmental Protection Agency--for studying and developing programs for the prevention, control, and clean-up of spills (including financial liabilities) of oil and hazardous materials. Therefore, this discussion is supplementary--related primarily to financing considerations to a study conducted by the Department of Transportation, U. S. Coast Guard on "Controlling of Hazardous Polluting Substances".

The spills problem is in all respects an actuarial one--what spills will occur in what volumes at what frequency in what locations, and what remedial costs will they occasion? Since the field of prediction is so broad, resources must be available in sufficient amount and flexibility to be mobilized to offset the effects of accident at any location. It is the classic condition for the use of insurance.

The circumstances call for the availability of stand-by technical resources to be moved readily to the point of spills and in sufficient amount to cover a reasonable level of expectation. No matter what the merits of special purpose funds in other pollutional contexts, no other technique of funding would seem so appropriate in this case.

The other aspect of the problem, measures to reduce the frequency of spill and dumping episodes, can also be approached through classic insurance rating procedures. Following the principle proposed for other types of pollutional activities, and allowing the cost of pollution control to be incorporated in the price of the product or service, it follows that the preventive and remedial costs may be levied as insurance premiums against potential sources of spills. Incentives can be implemented in the rate structure, basing the rate to any contributor on both availability of preventive equipment and procedures and his actuarial experience.

For the large hazard class of contributor--transportation firms and bulk storage facilities--a precise rating procedure would be justified. For the thousands of minor occasions of hazard (filling station operators, commercial users, retail fuel sales) an operator bonding requirement could be used to both fund remedial practices and to screen out the careless operator.

Administration of the insurance fund could take place with a variety of structures. Normal commercial underwriting would seem inappropriate, due to the costliness of subdivision of risk classes and competitive underwriting practices. A privately administered national insurance, operated by a pool of insurance firms, would, however, seem to fill

the requirements of the program. Federally administered insurance would serve equally well. Cooperative insurance ventures entered into by firms whose activities involve potential hazard is a third, equally viable, administrative source. (Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution, "Tovalop", administered by the International Tanker Owners Pollution Federation Ltd., is a limited and experimental effort to apply just such a concept.)

Other Financial Arrangements

Current practice requires that sources of spills assume responsibility for cleanup, and in certain circumstances fines may be assessed against spillors. In essence, this has the same effect as the proposed insurance scheme, in that it attempts to build the cost of pollution abatement into the price of the good that causes the pollution. Its principal deficiency is that it provides neither the imminent and controllable levy imposed by a variable insurance premium, nor any assurance that either the necessary technical or financial resources can be brought into play by the spillor. Provision of contingency plans have somewhat eliminated the latter problem for large spills and reduced it somewhat for the smaller spills. The small spills may be handled under the contingency type plan but probably not with the same dispatch.

Fines--which offer many of the features of insurance schemes, with the exception that costs are met after rather than before the occasion--have the same weaknesses.

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